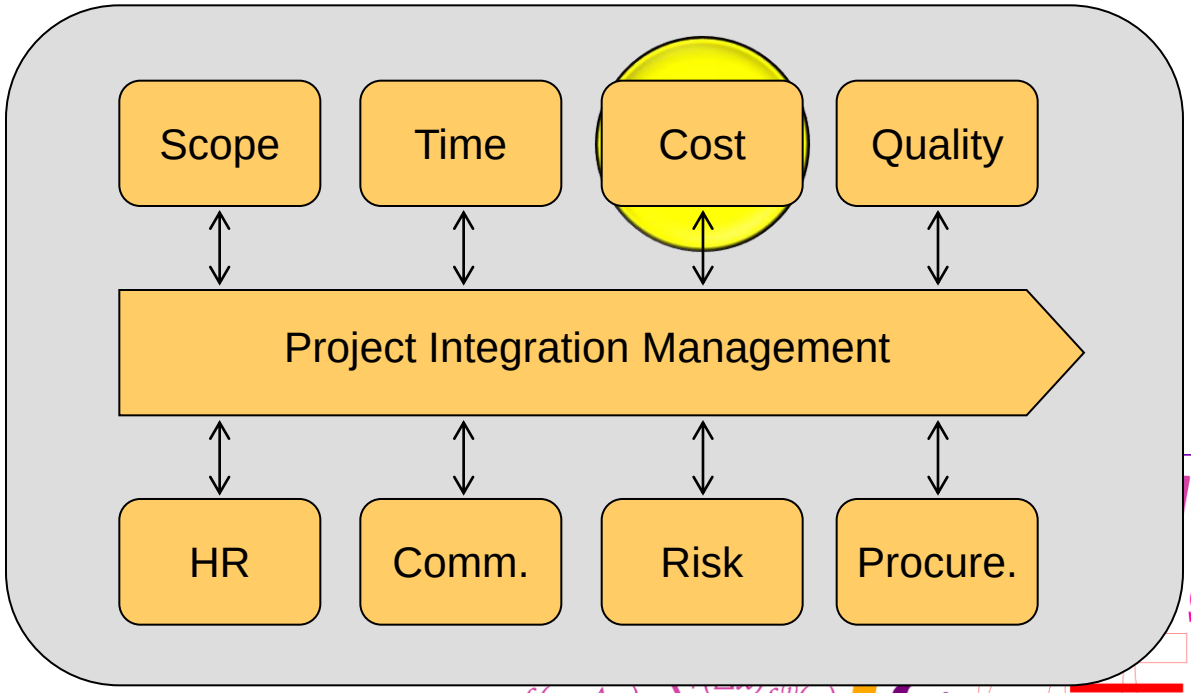
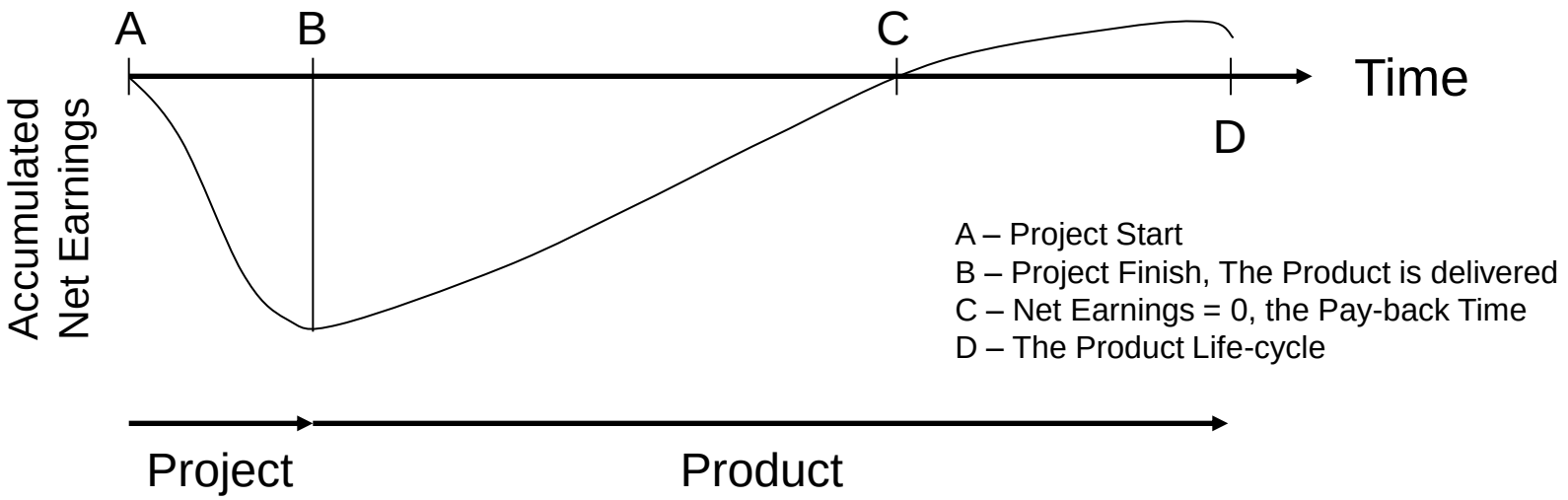
Project Cost Management



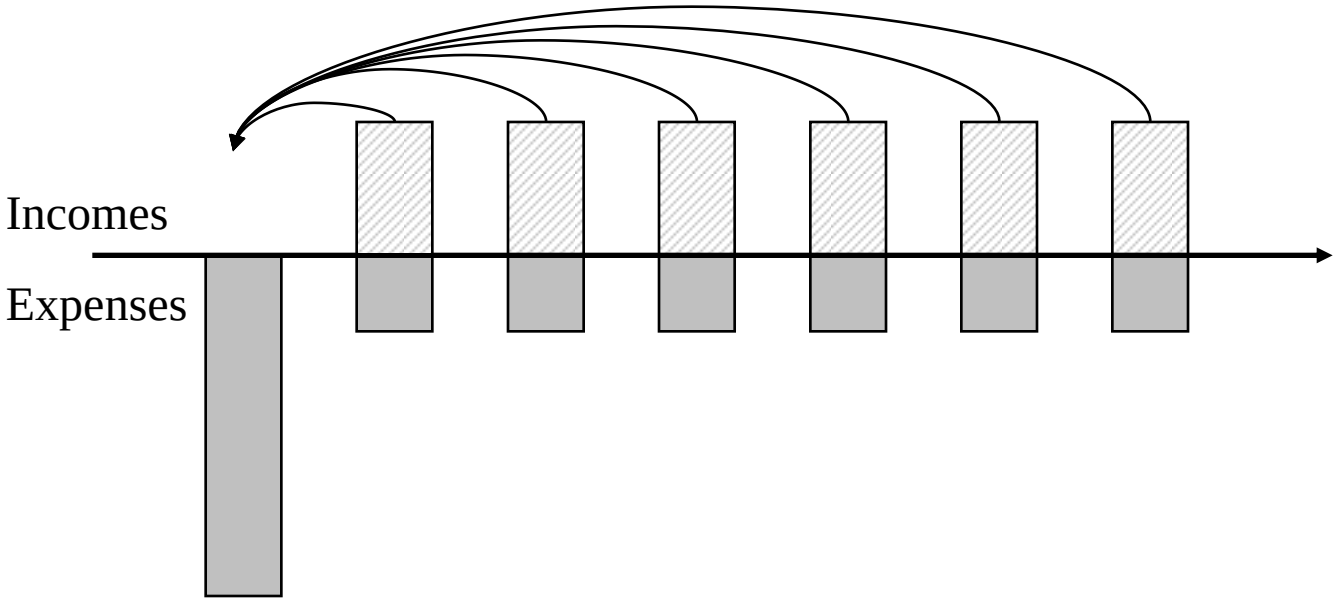
Life-Cycle Costs
- A Project is an Investment

”To estimate and analyse the costs of the immediate project investment and future earnings and expenses”



Life-Cycle Costs
- The Basic Principle

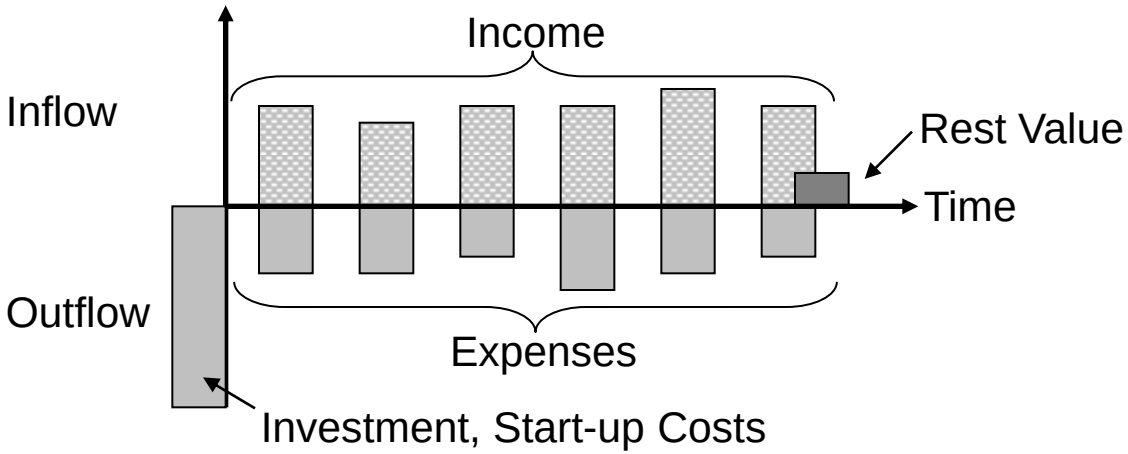
- Investment Analysis – Income/expenses during the life time of the product
- Cash Flow (in- and outflow) at different points in time cannot be compared
- Interest Rate – The cost of moving money over time



Life-Cycle Costs
- The Net Present Value

$$K = -K_0 + \Sigma [K_n * (1 + r)^{-n}] + R * (1 + r)^{-T}$$

K	=	Net Present Value (NPV)
K_0	=	Project Investment (Investment Budget)
K_n	=	Net Cash Flow (Inflow - Outflow)
T	=	The Total Time of the Cash-Flow Analysis
n	=	Time unit of Analysis
r	=	Discount Rate
R	=	Rest Value



Life-Cycle Costs
- The Net Present Value

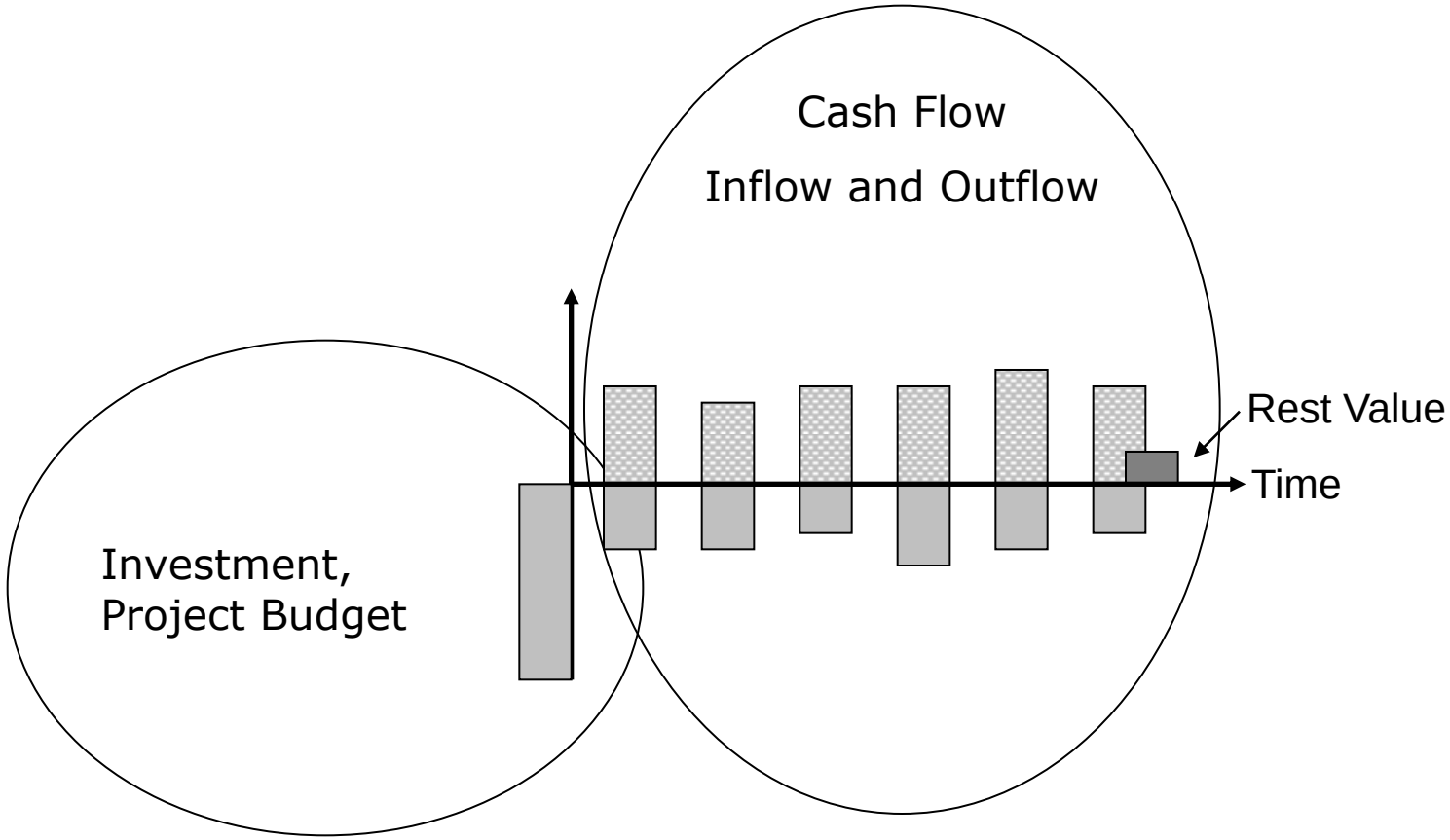
Net Present Value > 0, the investment will add value

About the Discount Rate:

- The discount rate corresponds to the rate of return that could have been earned on another investments under similar conditions.

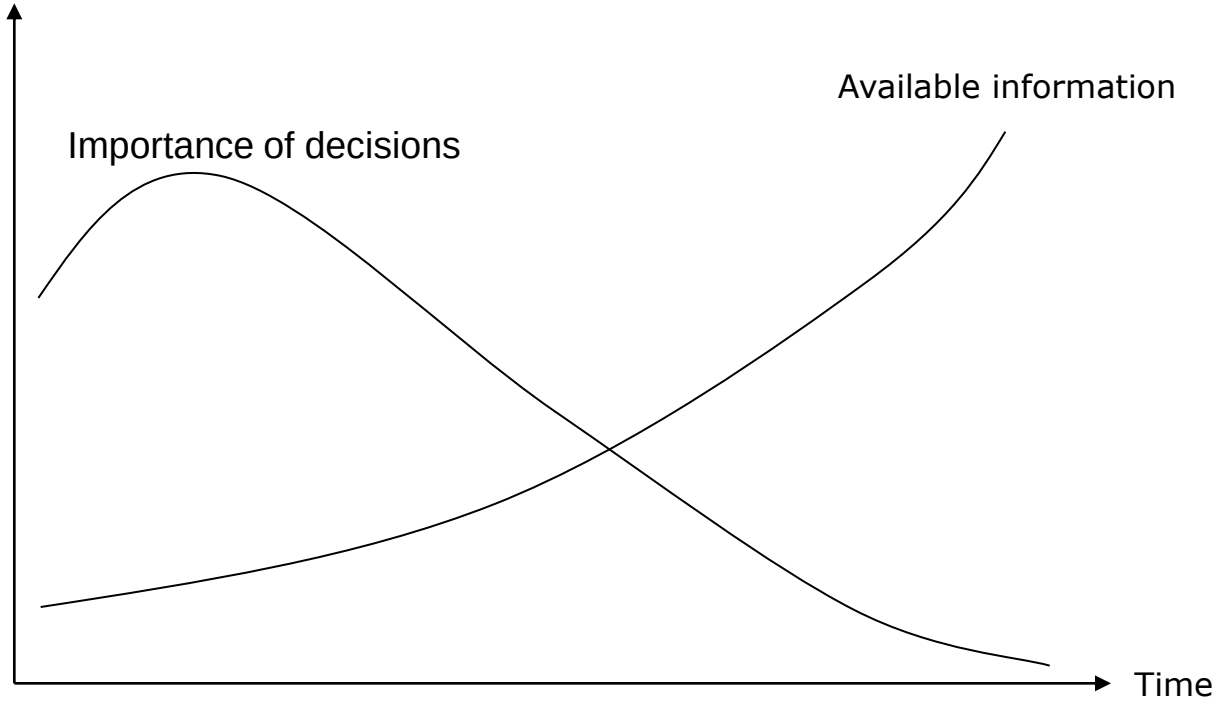
Life-Cycle Costs

Cash Flow – Inflow and Outflow

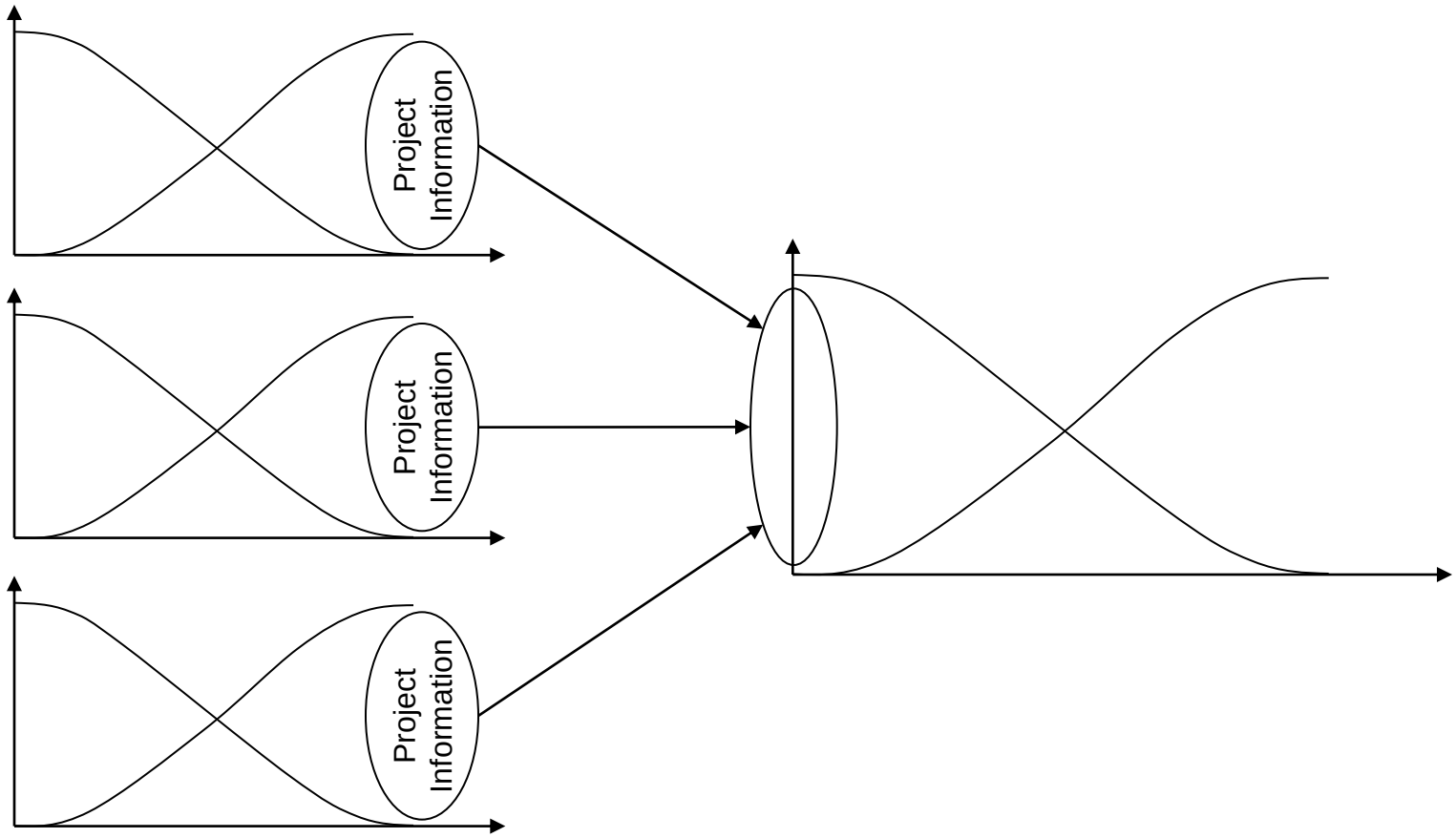


The Dilemma of Cost Estimation

- Decisions need to be taken in the early stage of the project
- Limited information available in the early stage of the project



Reference Projects – Experience Data



Project Budget

Cost Estimates – a Building Project Example

Example:
How much does it cost to hammer a nail down?

Building Materials – Nail
Equipment – Hammer
Labour – Carpenter (work)

Project Budget

Cost Estimates – a Building Project Example

Example:

How much does it cost to hammer a nail down in the tower of a Church?

Project Budget

Cost Estimates – a Building Project Example

Example:

How much does it cost to hammer TWO nails down in the tower of a Church?

Consider:

- Context/Conditions
- Volume
- Timing
- Etc.

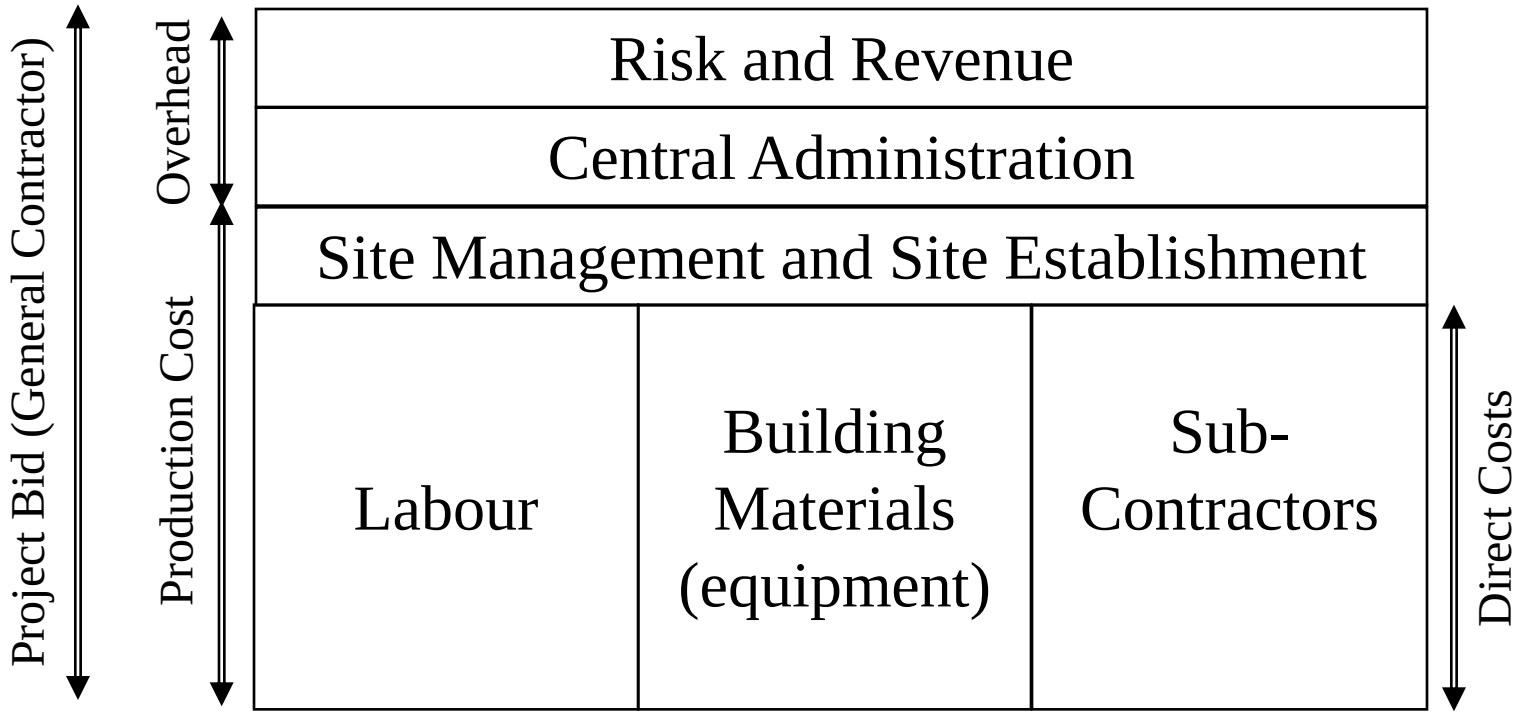
Project Budget

Cost Estimates – Building Projects

The Top-Down Approach

The Bottom-up Approach

Cost Estimates – Cost types



Cost Estimates – Scope and Structure

Real Estate
- Ground
- Taxes

Service Installations
- Electricity, communication
- Water supply
- Heating, etc.

Building Cost
- Ground
- Construction Works
- MEP-installations
- Painting
- Gardening

Design
- Geological survey
- Architectural design
- Engineering design
- Building permission

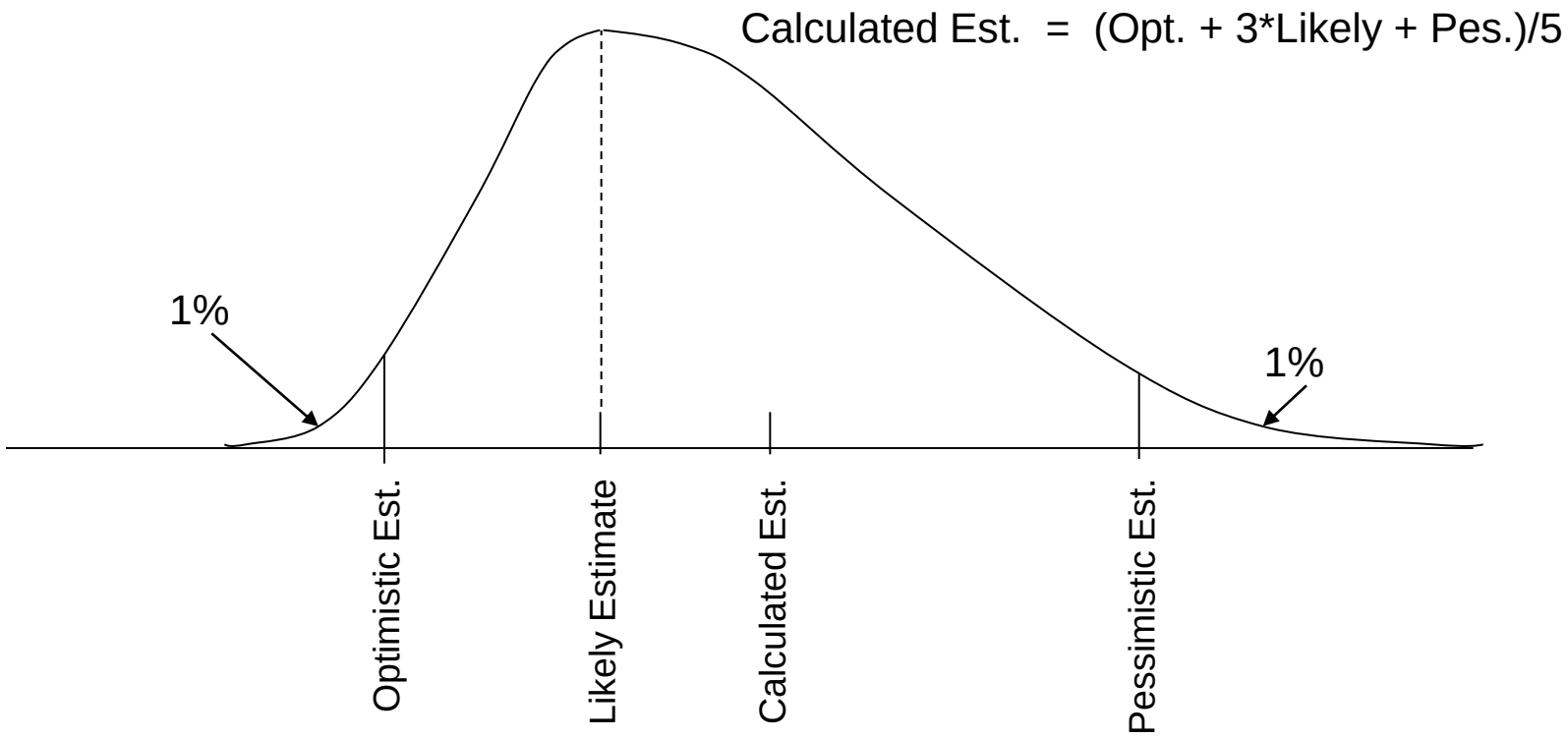
Other Client Costs
- Taxes
- Approvals
- Financial costs
- Etc.

$\sum$ Total Cost
(for the Client)

Cost Estimates

– The Successive Principle

Managing the Cost Distribution - Assessing the Uncertainty of Cost Estimates



Cost Estimates

– The Successive Principle

Step 1: Identification of Potential Risk Factors

Risk Factors:

- Project Location
- Building Standard
- Project Organisation
- Material Suppliers
- Etc.

- Market Situation (Upturn/downturn, competitors…)
- Interest rates
- Political Situation
- Etc.

Cost Estimates
– The Successive Principle

Step 2: Reference Conditions for each Risk Factor

Risk Factors:	Reference Conditions:
• Project Location	- Normal Conditions
• Building Standard	- High Standard
• Project Organisation	- Well-known Actors
• Material Suppliers	- Local
• Etc.	- …
• Market Situation	- Stable
• Interest rates	- X %
• Political Situation	- Stable
• Etc.	- …

Cost Estimates

– The Successive Principle

Step 3: Specific Project Conditions for each Risk Factor

Risk Factors:	Reference Conditions:	Exceptions (Project Specific):
• Project Location	- Suburban Area	- Down Town
• Building Standard	- High Standard	- Normal Standard
• Project Organisation	- Well-known Actors	- Partly new Players
• Material Suppliers	- Local	- Local and International
• Etc.	- …	- …
• Market Situation	- Stable	- Business Upturn
• Interest rates	- X %	- X %
• Political Situation	- Stable	- New Rules and Regulations
• Etc.	- …	- …

Cost Estimates

– The Successive Principle

Cost Items:	Opt.	Likely	Pes.	Cal.Cost	Stand.dev.	Var.
01 Real Estate	2 000	4 000	8 000	4 400	1 200	1 440
02 Service Installations	1 500	2 000	3 000	2 100	300	90
03 Building Cost						
03.01 Ground	2 200	3 000	4 500	3 140	460	211
03.02 Construction Works	4 000	6 500	8 000	6 300	800	640
04 Design						
04.01 Architectural design	300	500	900	540	120	14
04.02 Engineering design	150	300	500	310	70	5
05 Other Client Costs						
05.02 Financial costs	600	800	1 500	900	180	32

Calculated Cost = (Opt. + 3*Likely + Pes.) / 5
Standard Deviation, S = (Pes. – Opt.) / 5
Variance, V = S * S

Cost Estimates

– The Successive Principle

Cost Items:	Opt.	Likely	Pes.	Cal.Cost	Stand.dev.	Var.
01 Real Estate	2 000	4 000	8 000	4 400	1 200	1 440 ↓
02 Service Installations	1 500	2 000	3 000	2 100	300	90 ↓
03 Building Cost						
03.01 Ground	2 200	3 000	4 500	3 140	460	211 ↓
03.02 Construction Works	4 000	6 500	8 000	6 300	800	640 ↓
04 Design						
04.01 Architectural design	300	500	900	540	120	14 ↓
04.02 Engineering design	150	300	500	310	70	5 ↓
05 Other Client Costs						
05.02 Financial costs	600	800	1 500	900	180	32 ↓
General Risk Factors:						
Project Location	80	100	160	108	16	0,3 ↓
Building Standard	-360	-200	-120	-216	48	2,3 ↓
-----						
				17 582	1 561	2 435

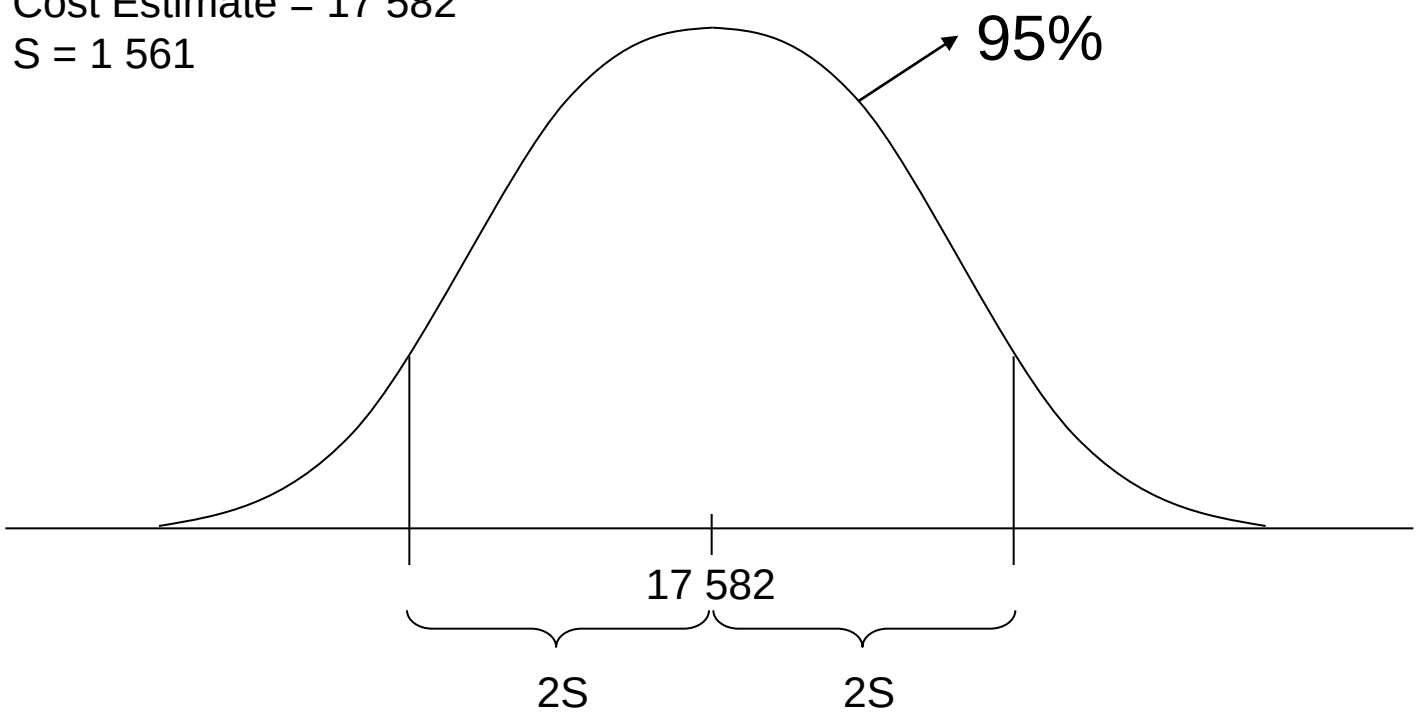
Cost Estimates

– The Successive Principle

Example:

Cost Estimate = 17 582

S = 1 561



Life-Cycle Costs

Cash Flow – Inflow and Outflow